WHAT IS CLAIMED IS:

1. A method of detecting particles in liquid samples, comprising the steps of:

bringing a piezo-electric crystal, comprising at least one surface adapted to bind to said particles in said liquid, in contact with said liquid; said crystal being adapted to exhibit resonant mechanical vibrations;

driving said crystal into mechanical vibration with a driving signal at a driving frequency;

connecting said crystal to a first input of a balanced comparator circuit having a low input impedance;

providing a cancellation signal at said driving frequency to a second input of said balanced comparator circuit;

detecting an output signal near said driving frequency at an output of said balanced comparator circuit;

adjusting said cancellation signal so that said output signal is substantially cancelled out;

increasing the amplitudes of said driving signal and said cancellation signal proportional to each other;

detecting transient signals at the output of said balanced circuitry; and

determining that target particles are present in said liquid, based on said transient signals.

2. A method according to claim 1, wherein said driving signal is a sinusoidal signal.

3. A method according to claim 1, wherein said driving frequency is above the fundamental series resonance frequency of said crystal.

4. A method according to claim 3, wherein said driving frequency is within the resonance spectrum of said crystal.

5. A method according to claim 1, wherein said driving frequency is below the fundamental series resonance frequency of said crystal.

6. A method according to claim 5, wherein said driving frequency is within the resonance spectrum of said crystal.

7. A method according to claim 1, wherein said driving frequency is substantially equal to the series resonance frequency of said crystal.

8. A method according to claim 1, wherein said piezo-electric crystal is a surface acoustic wave ("SAW") device.

9. A method according to claim 1, wherein said adjusting step further comprises adjusting an amplitude of said cancellation signal.

10. A method according to claim 1, wherein said adjusting step further comprises adjusting a phase of said cancellation signal.

11. A method according to claim 1, wherein said output signal is sinusoidal.

12. A method according to claim 1, further comprising the step of determining said optimum frequency by recording a conductivity magnitude resonance spectrum of the crystal under actual liquid loading conditions, and then calculating said optimum frequency as the frequency at which the first derivative of the conductivity magnitude resonance spectrum exhibits its maximum negative value.

13. A method according to claim 1, whereby said driving signal and said cancellation signal are derived from a common signal source.

14. A method according to claim 1, whereby transient signals are detected at frequencies from 170 kHz below said driving frequency to 170 kHz above said driving frequency.

15. A method according to claim 1, whereby transient signals are detected at frequencies from 300 kHz below said driving frequency to 300 kHz above said driving frequency.

16. A method according to claim 1, whereby transient signals are detected at many frequencies over a broadband region.

17. A method according to claim 1, whereby transient signals from said crystal are coupled into an electrical circuit under conditions of optimum impedance matching by using a low input impedance circuit.

18. A method according to claim 1, whereby the at least one surface of said crystal is adapted for binding to said particles in an area that is substantially adjacent to electrodes connected to said crystal.

19. A detector for use in detecting the presence of particles in liquid samples comprising:

a signal generator adapted to provide a driving signal to a transient signal isolation circuit,

said transient signal isolation circuit comprising a first signal splitting device, a resonant piezo-electric body connected in parallel to an attenuator and phase shifter circuit, and a comparator adapted to receive a first input signal from said resonant piezo-electric body and a second input signal from

said attenuator and phase shifter circuit, and to generate an output signal based on said first and second input signals;

a transient signal detector adapted to receive said output signal of said comparator and to provide a transient detection signal to said computer based on said output of said comparator, and further adapted to receive said output of said comparator and to provide a transient detection signal to said computer if said output of said comparator exceeds a threshold.

20. A detector as in claim 19, wherein said transient signal detector further comprises a low pass filter.

21. A detector as in claim 20, wherein said low pass filter comprises an adjustable time constant.

22. A detector as in claim 19, wherein said attenuation and phase shifter circuit is adapted to be controlled by said computer.

23. A detector as in claim 19, wherein said signal generator is adapted to be controlled by said computer.

24. A detector as in claim 19, wherein said signal generator is adapted to generate RF signals.

25. A detector as in claim 19, wherein said signal generator is adapted to generate sinusoidal signals.

26. A detector as in claim 19, wherein said signal generator is adapted to generate non-sinusoidal signals.

27. A detector as in claim 19, wherein said comparator comprises a transformer having a primary coil having a center tap connected to a substantially fixed potential, and a secondary coil adapted to generate said output of said comparator.

28. A detector as in claim 27, wherein said fixed potential is ground potential.

29. A detector as in claim 19, wherein said comparator comprises a first and second resistors connected in series between said resonant piezo-electric body and said attenuation and phase shifter circuit.

30. A detector as in claim 29, wherein said output of said comparator is connected to a node between said first and second resistors.

31. A detector as in claim 29, wherein said first and second resistor have substantially equivalent resistance.

32. A detector as in claim 31, wherein said resistance is between 10Ω and 1000Ω.

33. A detector as in claim 31, wherein said resistance is between 100Ω and 10kΩ.

34. A detector as in claim 19, wherein said comparator comprises a differential amplifier having a first input connected to said resonant piezo-electric body and a second input connected to said attenuation and phase shifter circuit.

35. A detector as in claim 34, wherein said differential amplifier is an RF differential amplifier.

36. A detector as in claim 19, further comprising an amplifier adapted to amplify said driving signal and to provide an amplified driving signal to said transient signal isolation circuit.

37. A detector as in claim 36, wherein said amplifier is adapted to be controlled by said computer.

38. A detector as in claim 19, wherein said transient signal detector is a lock-in amplifier adapted to be controlled by said reference signal.

39. A detector as in claim 19, further comprising a low frequency offset signal generator adapted to generate a low frequency offset signal, and a mixer adapted to receive said reference signal and said low-frequency offset signal and to generate an offset reference signal.

40. A detector as in claim 39, wherein said mixer is further adapted to provide said offset reference signal to said transient signal detector.

41. A detector as in claim 19, wherein said attenuator and phase shifter circuit is adapted to be controlled by said computer.

42. A detector as in claim 19, wherein said resonant piezo-electric body comprises a resonant crystal.

43. A detector as in claim 42, wherein said resonant crystal is a piezo-electric crystal.

44. A detector as in claim 42, wherein said resonant crystal is a surface acoustic wave device.

45. A detector as in claim 19, wherein said transient signal detector is adapted to receive said transient detection signal and to provide said transient detection signal to said computer if said transient detection signal exceeds a threshold.

46. A detector as in claim 19, wherein said transient signal detector is implemented as software running on said computer.

47. A detector as in claim 19, wherein said low pass filter is implemented as software running on said computer.

48. A detector as in claim 19, wherein said transient signal isolation circuit further comprises a transformer having a primary coil connected between said signal generator and a first fixed potential, and a secondary coil connected between said resonant body and said attenuation and phase shifter circuit, said secondary coil further comprising a center tap connected to a second fixed potential.

49. A detector as in claim 48, wherein said first fixed potential is ground potential.

50. A detector as in claim 48, wherein said second fixed potential is ground potential.

51. A detector as in claim 19, wherein said transient signal detector threshold is adjustable.

52. A detector as in claim 19, wherein said transient signal detector is adapted to generate a transient detection signal that is proportional to said output of said comparator.

53. A detector as in claim 19, wherein said transient signal detector is sensitive to signals within the 100-nV to 100-μV range.

54. A detector as in claim 19, wherein said transient signal detector comprises a lock-in amplifier with harmonics capability.

55. A detector as in claim 19, wherein said transient signal detector generates output in digital formal.

56. A detector as in claim 19, wherein said transient signal detector generates output in analog format.

57. A detector as in claim 19, wherein said transient signal detector is a synchronous detector.

58. A detector as in claim 57, wherein said synchronous detector is a lock-in amplifier.

59. A detector as in claim 19, wherein said mixer is a single sideband modulator.